Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/486
BRAZIL
February 1964
Original: ENGLISH

Confidential until official release during Conference

Abstract

EXPERIMENTAL STUDIES ON THE FABRICATION OF THIN FUEL PLATES WITH U_3O_8-Al CERMETS

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The paper describes the experimental work done on the fabrication of aluminum alloy clad fuel plates, 0,7 mm thick, containing a core of U_3O_8 cermet, which are of interest for fuel assemblies of advanced research reactors. The production of such very thin, totally clad fuel plates, does present many fabrication difficulties, which were finally overcome through systematic study of the production variables.

The plates were to be between 75 and 110 mm wide, with 0,15 to 0,20 mm thick face cladding on the 0,30 to 0,40 mm plastically deformed core, which was to contain between 50 and 70 % U_3O_8 dispersed with aluminum.

The investigation comprised both the cast cladding and the roll bonding of picture frame alternatives. The main variables studied were: a) for cast cladding: cermet preparation after pressing and sintering under argon; influence of the casting variables for the most suitable aluminum alloys (1100 and

M-388); conditioning and heat treatment of the cored ingots; hot rolling and final cold rolling to the final dimensions ; b) for roll bonding of picture frame sets: cermet insertion into the frame; assembly of the picture frame components; argon arc welding of the assembled sets; furnace soaking; hot roll bonding and final cold rolling. The thin plates thus p produced were examined by auto-radiography, by metallographic methods and were also subjected to corrosion tests, in hot de-ionized water.

Studies were further conducted on the shaping of the wide thin strips into corrugated shapes to be assembled in fuel elements of simple design which allows high UO_2/Al ratios.

The obtained results have shown that both procedures can be adopted, the cast cladding alternative being the process suitable for the fabrication of extra wide plates.